DECLARATION

I, NOBUMITSU ASAHI, a Japanese Patent Attorney registered No.10435, of Okabe International Patent Office at No. 602, Fuji Bldg., 2-3, Marunouchi 3-chome, Chiyoda-ku, Tokyo, Japan, hereby declare that I have a thorough knowledge of Japanese and English languages, and that the attached pages contain a correct translation into English of the priority documents of Japanese Patent Application No. 2001-010665 filed on January 18, 2001 in the name of CANON KABUSHIKI KAISHA.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made, are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this ⟨signature⟩ day of August, 2008

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NOBUMITSU ASAHI

PATENT OFFICE
JAPANESE GOVERNMENT

This is to certify that the annexed is a true copy of the following application as filed with this Office.

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Applicant(s):   CANON KABUSHIKI KAISHA

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Applicant's Information

Identification No.   [000001007]
1. Date of Change: August 30, 1990
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   Address: 3-30-2, Shimomaruko, Ohta-ku, Tokyo
   Name: CANON KABUSHIKI KAISHA

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[Title of the Invention]   IMAGE DISPLAYING APPARATUS AND IMAGE
                           DISPLAYING METHOD RESPECTIVELY HAVING
                           IMAGE QUALITY ADJUSTMENT FUNCTION, AND
                           RECORDING MEDIUM

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[Inventor]

    [Domicile or Residence] c/o Canon Kabushiki Kaisha
                             3-30-2, Shimomaruko, Ohta-ku,
                             Tokyo

    [Name]   MASAKI NAKANO

[Applicant]

    [Identification No.]   000001007

    [Name]   CANON KABUSHIKI KAISHA

[Attorney]

    [Identification No.]   100077481

    [Patent Attorney]

    [Name]   YOSHIKAZU TANI

[Elected Attorney]
    [Identification No.]   100088915

    [Patent Attorney]

    [Name]   KAZUO ABE

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[Title of the Invention]

IMAGE DISPLAYING APPARATUS AND IMAGE DISPLAYING

METHOD RESPECTIVELY HAVING IMAGE QUALITY ADJUSTMENT

5   FUNCTION, AND RECORDING MEDIUM

[Claims]

1. An image displaying apparatus comprising:

multiscreen synthesis means for composing one

10   screen by executing a trimming process to a part of

an input image and arranging plural pieces of that

image;

image quality adjustment value storage means for

storing plural combinations of image quality

15   adjustment values such as lightness, contrast,

chromaticity, hue, RGB (red, green and blue) balance,

color temperature, gamma characteristics, sharpness

(emphasis) and the like;

image quality adjustment process means for

20   executing the image quality adjustment processes for

plural images on the basis of the image quality

adjustment values of the respective combinations

stored in said image quality adjustment value storage

means; and

25   control means for converting an input image into

a first image to which an image quality adjustment

process was executed by said image quality adjustment

process means on the basis of an image quality
adjustment value before performing an image quality
adjustment operation stored in said image quality
adjustment value storage means, and similarly

5   converting the input image into a second image to
which an image quality adjustment process was
executed by said image quality adjustment process
means on the basis of an image quality adjustment
value of newly performing an adjustment operation,

10   then displaying the converted first and second images
on one screen with arranged state by said multiscreen
synthesis means.

2. An image displaying apparatus comprising:
image enlargement and reduction means for

15   enlarging and reducing an input image;
multiscreen synthesis means for composing one
screen by arranging plural pieces of the input image
reduced by said image enlargement and reduction
means;

20   image quality adjustment value storage means for
storing plural combinations of image quality
adjustment values such as lightness, contrast,
chromaticity, hue, RGB balance, color temperature,
gamma characteristics, sharpness (emphasis) and the

25   like;
image quality adjustment process means for
executing the image quality adjustment processes for

plural images on the basis of the image quality
adjustment values of the respective combinations
stored in said image quality adjustment value storage
means; and

5   control means for executing an image quality
adjustment process to an input image by said image
quality adjustment process means on the basis of an
image quality adjustment value before performing an
image quality adjustment operation stored in said

10   image quality adjustment value storage means and
converting the input image into a first image which
was reduced by said image enlargement and reduction
means, and similarly executing an image quality
adjustment process to the input image by said image

15   quality adjustment process means on the basis of an
image quality adjustment value of newly performing an
adjustment operation and converting the input image
into a second image which was reduced by said image
enlargement and reduction means, then displaying the

20   converted first and second images on one screen with
arranged state by said multiscreen synthesis means.

    3. An image displaying apparatus comprising:

    image enlargement and reduction means for
enlarging and reducing an input image;

25   multiscreen synthesis means for composing one
screen by executing a trimming process to a part of
the image reduced by said image enlargement and

reduction means and arranging plural pieces of that
image;

image quality adjustment value storage means for
storing plural combinations of image quality
5   adjustment values such as lightness, contrast,
chromaticity, hue, RGB balance, color temperature,
gamma characteristics, sharpness (emphasis) and the
like;

image quality adjustment process means for
10   executing the image quality adjustment processes for
plural images on the basis of each of combinations of
the image quality adjustment values stored in said
image quality adjustment value storage means; and

control means for executing an image quality
15   adjustment process to an input image by said image
quality adjustment process means on the basis of an
image quality adjustment value before performing an
image quality adjustment operation stored in said
image quality adjustment value storage means and
20   converting the input image into a first image which
was reduced by said image enlargement and reduction
means, and similarly executing an image quality
adjustment process to the input image by said image
quality adjustment process means on the basis of an
25   image quality adjustment value of newly performing an
adjustment operation and converting the input image
into a second image which was reduced by said image

enlargement and reduction means, then displaying the converted first and second images on one screen with arranged state by said multiscreen synthesis means.

4. An image displaying apparatus according to any one of Claims 1 to 3, wherein

images which are displayed on one screen with arranged state by said multiscreen synthesis means are two pieces, and the image quality adjustment value before performing the image quality adjustment operation stored in said image quality adjustment value storage means coincides with a value which was previously set at a time of manufacturing, and

said multiscreen synthesis means displays an image to which the image quality adjustment process was executed on the basis of the value which was previously set at the time of manufacturing and an image to which the image quality adjustment process was executed on the basis of the image quality adjustment value of performing the adjustment operation on one screen with arranged state.

5. An image displaying apparatus according to any one of Claims 1 to 3, wherein

images which are displayed on one screen with arranged state by said multiscreen synthesis means are two pieces, and the image quality adjustment value before performing the image quality adjustment operation stored in said image quality adjustment

value storage means coincides with a value which was used just before starting the image quality adjustment operation, and

said multiscreen synthesis means displays an image to which the image quality adjustment process was executed on the basis of the value which was used just before starting the image quality adjustment operation and an image to which the image quality adjustment process was executed on the basis of the image quality adjustment value of performing the adjustment operation on one screen with arranged state.

6. An image displaying apparatus according to any one of Claims 1 to 3, wherein

images which are displayed with arranged state by said multiscreen synthesis means are two pieces, and any one value can be selected from a value which was previously set at a time of manufacturing or a value which was used just before starting the image quality adjustment operation as the image quality adjustment value before performing the image quality adjustment operation stored in said image quality adjustment value storage means, and

said multiscreen synthesis means displays any one image from an image to which the image quality adjustment process was executed on the basis of the value which was previously set at the time of

manufacturing or an image to which the image quality adjustment process was executed on the basis of the value which was used just before starting the image quality adjustment operation and an image to which

5　the image quality adjustment process was executed on the basis of the image quality adjustment value of performing the adjustment operation on one screen with arranged state.

7.　An image displaying apparatus according to

10　any one of Claims 1 to 3, wherein

images which are displayed with arranged state by said multiscreen synthesis means are three pieces, and the image quality adjustment values before performing the image quality adjustment operation

15　stored in said image quality adjustment value storage means are two values which were previously set at a time of manufacturing and used just before starting the image quality adjustment operation, and

said multiscreen synthesis means displays three

20　pieces of an image to which the image quality adjustment process was executed on the basis of the value which was previously set at the time of manufacturing, an image to which the image quality adjustment process was executed on the basis of the

25　value which was used just before starting the image quality adjustment operation and an image to which the image quality adjustment process was executed on

the basis of the image quality adjustment value of performing the adjustment operation on one screen with arranged state.

8. An image displaying apparatus according to any one of Claims 1 to 7, further comprising operation means for arbitrarily setting a reduction ratio in said image enlargement and reduction means and image arrangement or trimming position in said multiscreen synthesis means.

9. An image displaying method comprising:

a multiscreen synthesis step of composing one screen by executing a trimming process to a part of an input image and arranging plural pieces of that image;

an image quality adjustment value storage step of storing plural combinations of various image quality adjustment values such as lightness, contrast, chromaticity, hue, RGB balance, color temperature, gamma characteristics, sharpness (emphasis) and the like; and

an image quality adjustment process step of executing the image quality adjustment processes for plural images on the basis of each of combinations of the image quality adjustment values stored in said image quality adjustment value storage step,

wherein an input image is converted into a first image to which an image quality adjustment process

was executed in said image quality adjustment process
step on the basis of an image quality adjustment
value before performing an image quality adjustment
operation stored in said image quality adjustment

5   value storage step, and similarly the input image is
converted into a second image to which an image
quality adjustment process was executed in said image
quality adjustment process step on the basis of an
image quality adjustment value of newly performing an

10   adjustment operation, then the converted first and
second images are displayed on one screen with
arranged state in said multiscreen synthesis step.

10. An image displaying method comprising:

an image enlargement and reduction step of

15   enlarging and reducing an input image;

a multiscreen synthesis step of composing one
screen by arranging plural pieces of the input image
reduced in said image enlargement and reduction step;

an image quality adjustment value storage step

20   of storing plural combinations of image quality
adjustment values such as lightness, contrast,
chromaticity, hue, RGB balance, color temperature,
gamma characteristics, sharpness (emphasis) and the
like; and

25   an image quality adjustment process step of
executing the image quality adjustment processes for
plural images on the basis of each of combinations of

the image quality adjustment values stored in said

image quality adjustment value storage step,

wherein an image quality adjustment process is

executed to an input image in said image quality

5   adjustment process step on the basis of an image

quality adjustment value before performing an image

quality adjustment operation stored in said image

quality adjustment value storage step and the input

image is converted into a first image which was

10   reduced in said image enlargement and reduction step,

and similarly an image quality adjustment process is

executed to the input image in said image quality

adjustment process step on the basis of an image

quality adjustment value of newly performing an

15   adjustment operation and the input image is converted

into a second image which was reduced in said image

enlargement and reduction step, then the converted

first and second images are displayed on one screen

with arranged state in said multiscreen synthesis

20   step.

11. An image displaying method comprising:

an image enlargement and reduction step of

enlarging and reducing an input image;

a multiscreen synthesis step of composing one

25   screen by executing a trimming process to a part of

the image reduced in said image enlargement and

reduction step and arranging plural pieces of that

image;

an image quality adjustment value storage step
of storing plural combinations of image quality
adjustment values such as lightness, contrast,
chromaticity, hue, RGB balance, color temperature,
gamma characteristics, sharpness (emphasis) and the
like; and

an image quality adjustment process step of
executing the image quality adjustment processes for
plural images on the basis of each of combinations of
the image quality adjustment values stored in said
image quality adjustment value storage step,

wherein an image quality adjustment process is
executed to an input image in said image quality
adjustment process step on the basis of an image
quality adjustment value before performing an image
quality adjustment operation stored in said image
quality adjustment value storage step and the input
image is converted into a first image which was
reduced in said image enlargement and reduction step,
and similarly an image quality adjustment process is
executed to the input image in said image quality
adjustment process step on the basis of an image
quality adjustment value of newly performing an
adjustment operation and the input image is converted
into a second image which was reduced in said image
enlargement and reduction step, then the converted

first and second images are displayed on one screen
with arranged state in said multiscreen synthesis
step.

12. An image displaying method according to any
one of Claims 9 to 11, wherein

images which are displayed on one screen with
arranged state in said multiscreen synthesis step are
two pieces, and the image quality adjustment value
before performing the image quality adjustment
operation stored in said image quality adjustment
value storage step coincides with a value which was
previously set at a time of manufacturing, and

said multiscreen synthesis step displays an
image to which the image quality adjustment process
was executed on the basis of the value which was
previously set at the time of manufacturing and an
image to which the image quality adjustment process
was executed on the basis of the image quality
adjustment value of performing the adjustment
operation on one screen with arranged state.

13. An image displaying method according to any
one of Claims 9 to 11, wherein

images which are displayed on one screen with
arranged state in said multiscreen synthesis step are
two pieces, and the image quality adjustment value
before performing the image quality adjustment
operation stored in said image quality adjustment

value storage step coincides with a value which was used just before starting the image quality adjustment operation, and

said multiscreen synthesis step displays an image to which the image quality adjustment process was executed on the basis of the value which was used just before starting the image quality adjustment operation and an image to which the image quality adjustment process was executed on the basis of the image quality adjustment value of performing the adjustment operation on one screen with arranged state.

14. An image displaying method according to any one of Claims 9 to 11, wherein

images which are displayed with arranged state in said multiscreen synthesis step are two pieces, and any one value can be selected from a value which was previously set at a time of manufacturing or a value which was used just before starting the image quality adjustment operation as the image quality adjustment value before performing the image quality adjustment operation stored in said image quality adjustment value storage step, and

said multiscreen synthesis step displays any one image from an image to which the image quality adjustment process was executed on the basis of the value which was previously set at the time of

manufacturing or an image to which the image quality adjustment process was executed on the basis of the value which was used just before starting the image quality adjustment operation and an image to which

5   the image quality adjustment process was executed on the basis of the image quality adjustment value of performing the adjustment operation on one screen with arranged state.

15. An image displaying method according to any
10   one of Claims 9 to 11, wherein

images which are displayed with arranged state in said multiscreen synthesis step are three pieces, and the image quality adjustment values before performing the image quality adjustment operation
15   stored in said image quality adjustment value storage step are two values which were previously set at a time of manufacturing and used just before starting the image quality adjustment operation, and

said multiscreen synthesis step displays three
20   pieces of an image to which the image quality adjustment process was executed on the basis of the value which was previously set at the time of manufacturing, an image to which the image quality adjustment process was executed on the basis of the
25   value which was used just before starting the image quality adjustment operation and an image to which the image quality adjustment process was executed on

the basis of the image quality adjustment value of performing the adjustment operation on one screen with arranged state.

16. An image displaying method according to any one of Claims 9 to 15, further comprising an operation step of arbitrarily setting a reduction ratio in said image enlargement and reduction step and image arrangement or trimming position in said multiscreen synthesis step.

17. A recording medium which records an image display program for controlling an image displaying apparatus by a computer, wherein said program causes the computer to

convert an input image into a first image to which an image quality adjustment process was executed on the basis of a stored image quality adjustment value before performing an image quality adjustment operation, and into a second image to which an image quality adjustment process was executed on the basis of an image quality adjustment value of newly performing an adjustment operation, and

execute a trimming process to parts of the converted first and second images to display obtained image pieces on one screen with arranged state.

18. A recording medium which records an image display program for controlling an image displaying

apparatus by a computer, wherein said program causes the computer to

execute an image quality adjustment process to an input image on the basis of a stored image quality adjustment value before performing an image quality adjustment operation and convert the input image into a first image which was reduced, and execute an image quality adjustment process to the input image on the basis of an image quality adjustment value of newly performing an adjustment operation and convert the input image into a second image which was reduced, and

display the converted first and second images on one screen with arranged state.

19. A recording medium which records an image display program for controlling an image displaying apparatus by a computer, wherein said program causes the computer to

execute an image quality adjustment process to an input image on the basis of a stored image quality adjustment value before performing an image quality adjustment operation and convert the input image into a first image which was reduced, and execute an image quality adjustment process to the input image on the basis of an image quality adjustment value of newly performing an adjustment operation and convert the input image into a second image which was reduced,

and

　　　execute a trimming process to each part of the
converted first and second images to display obtained
image pieces on one screen with arranged state.

5

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

　　　The present invention relates to image

10　displaying apparatus and image displaying method
having an image quality adjustment function suitable
for a TV or the like, and a recording medium storing
a program to achieve the above method.

[0002]

15　[Prior Art]

　　　Conventionally, an image processing apparatus
such as a TV set or the like has various image
quality adjustment functions related to hue,
chromaticity, contrast, lightness and the like on a

20　displayed image.

[0003]

[Problem to be Solved by the Invention]

　　　However, in the image quality adjustment in this
kind of conventional image processing apparatus, it

25　is hard to objectively know effect, difference or the
like in the adjustment, therefore, there is a problem
that it is hard to judge whether or not the optimum

adjustment was performed.

[0004]

The present invention is made in consideration of the above-mentioned problem, and an object thereof

5   is to provide convenience in performing image quality adjustment by simultaneously displaying a preadjustment image, a default adjustment image and an adjustment image when the image quality adjustment such as adjustment of contrast, color balance or the

10   like is performed in an image displaying apparatus.

[0005]

[Means and Operations for Solving the Problem]

To achieve the above object, the invention as recited in Claim 1 is characterized by an image

15   displaying apparatus comprising: multiscreen synthesis means for composing one screen by executing a trimming process to a part of an input image and arranging plural pieces of that image; image quality adjustment value storage means for storing plural

20   combinations of image quality adjustment values such as lightness, contrast, chromaticity, hue, RGB balance, color temperature, gamma characteristics, sharpness (emphasis) and the like; image quality adjustment process means for executing the image

25   quality adjustment processes for plural images on the basis of the image quality adjustment values of the respective combinations stored in the image quality

adjustment value storage means; and control means for converting an input image into a first image to which an image quality adjustment process was executed by the image quality adjustment process means on the

5 basis of an image quality adjustment value before performing an image quality adjustment operation stored in the image quality adjustment value storage means, and similarly converting the input image into a second image to which an image quality adjustment

10 process was executed by the image quality adjustment process means on the basis of an image quality adjustment value of newly performing an adjustment operation, then displaying the converted first and second images on one screen with arranged state by

15 the multiscreen synthesis means.

[0006]

To achieve the above object, the invention as recited in Claim 1 is characterized by an image displaying apparatus comprising: image enlargement

20 and reduction means for enlarging and reducing an input image; multiscreen synthesis means for composing one screen by arranging plural pieces of the input image reduced by the image enlargement and reduction means; image quality adjustment value

25 storage means for storing plural combinations of image quality adjustment values such as lightness, contrast, chromaticity, hue, RGB balance, color

temperature, gamma characteristics, sharpness (emphasis) and the like; image quality adjustment process means for executing the image quality adjustment processes for plural images on the basis

5   of the image quality adjustment values of the respective combinations stored in the image quality adjustment value storage means; and control means for executing an image quality adjustment process to an input image by the image quality adjustment process

10   means on the basis of an image quality adjustment value before performing an image quality adjustment operation stored in the image quality adjustment value storage means and converting the input image into a first image which was reduced by the image

15   enlargement and reduction means, and similarly executing an image quality adjustment process to the input image by the image quality adjustment process means on the basis of an image quality adjustment value of newly performing an adjustment operation and

20   converting the input image into a second image which was reduced by the image enlargement and reduction means, then displaying the converted first and second images on one screen with arranged state by the multiscreen synthesis means.

25   [0007]

To achieve the above object, the invention as recited in Claim 3 is characterized by an image

displaying apparatus comprising: image enlargement and reduction means for enlarging and reducing an input image; multiscreen synthesis means for composing one screen by executing a trimming process

5   to a part of the image reduced by the image enlargement and reduction means and arranging plural pieces of that image; image quality adjustment value storage means for storing plural combinations of image quality adjustment values such as lightness,

10   contrast, chromaticity, hue, RGB balance, color temperature, gamma characteristics, sharpness (emphasis) and the like; image quality adjustment process means for executing the image quality adjustment processes for plural images on the basis

15   of each of combinations of the image quality adjustment values stored in the image quality adjustment value storage means; and control means for executing an image quality adjustment process to an input image by the image quality adjustment process

20   means on the basis of an image quality adjustment value before performing an image quality adjustment operation stored in the image quality adjustment value storage means and converting the input image into a first image which was reduced by the image

25   enlargement and reduction means, and similarly executing an image quality adjustment process to the input image by the image quality adjustment process

means on the basis of an image quality adjustment value of newly performing an adjustment operation and converting the input image into a second image which was reduced by the image enlargement and reduction means, then displaying the converted first and second images on one screen with arranged state by the multiscreen synthesis means.

[0008]

Here, it is possible to be characterized in that images which are displayed on one screen with arranged state by the multiscreen synthesis means are two pieces, and the image quality adjustment value before performing the image quality adjustment operation stored in the image quality adjustment value storage means coincides with a value which was previously set at a time of manufacturing, and the multiscreen synthesis means displays an image to which the image quality adjustment process was executed on the basis of the value which was previously set at the time of manufacturing and an image to which the image quality adjustment process was executed on the basis of the image quality adjustment value of performing the adjustment operation on one screen with arranged state.

[0009]

Further, it is possible to be characterized in that images which are displayed on one screen with

arranged state by the multiscreen synthesis means are two pieces, and the image quality adjustment value before performing the image quality adjustment operation stored in the image quality adjustment

5 value storage means coincides with a value which was used just before starting the image quality adjustment operation, and the multiscreen synthesis means displays an image to which the image quality adjustment process was executed on the basis of the

10 value which was used just before starting the image quality adjustment operation and an image to which the image quality adjustment process was executed on the basis of the image quality adjustment value of performing the adjustment operation on one screen

15 with arranged state.

[0010]

Furthermore, it is possible to be characterized in that images which are displayed with arranged state by the multiscreen synthesis means are two

20 pieces, and any one value can be selected from a value which was previously set at a time of manufacturing or a value which was used just before starting the image quality adjustment operation as the image quality adjustment value before performing

25 the image quality adjustment operation stored in the image quality adjustment value storage means, and the multiscreen synthesis means displays any one image

from an image to which the image quality adjustment process was executed on the basis of the value which was previously set at the time of manufacturing or an image to which the image quality adjustment process

5 was executed on the basis of the value which was used just before starting the image quality adjustment operation and an image to which the image quality adjustment process was executed on the basis of the image quality adjustment value of performing the

10 adjustment operation on one screen with arranged state.

[0011]

Furthermore, it is possible to be characterized in that images which are displayed with arranged

15 state by the multiscreen synthesis means are three pieces, and the image quality adjustment values before performing the image quality adjustment operation stored in the image quality adjustment value storage means are two values which were

20 previously set at a time of manufacturing and used just before starting the image quality adjustment operation, and the multiscreen synthesis means displays three pieces of an image to which the image quality adjustment process was executed on the basis

25 of the value which was previously set at the time of manufacturing, an image to which the image quality adjustment process was executed on the basis of the

value which was used just before starting the image
quality adjustment operation and an image to which
the image quality adjustment process was executed on
the basis of the image quality adjustment value of
5   performing the adjustment operation on one screen
with arranged state.
[0012]

Furthermore, it is possible to be characterized
by further comprising operation means for arbitrarily
10   setting a reduction ratio in the image enlargement
and reduction means and image arrangement or trimming
position in the multiscreen synthesis means.
[0013]

To achieve the above object, the invention as
15   recited in Claim 9 is characterized by an image
displaying method comprising: a multiscreen synthesis
step of composing one screen by executing a trimming
process to a part of an input image and arranging
plural pieces of that image; an image quality
20   adjustment value storage step of storing plural
combinations of various image quality adjustment
values such as lightness, contrast, chromaticity, hue,
RGB balance, color temperature, gamma characteristics,
sharpness (emphasis) and the like; and an image
25   quality adjustment process step of executing the
image quality adjustment processes for plural images
on the basis of each of combinations of the image

quality adjustment values stored in the image quality
adjustment value storage step, wherein an input image
is converted into a first image to which an image
quality adjustment process was executed in the image
5   quality adjustment process step on the basis of an
image quality adjustment value before performing an
image quality adjustment operation stored in the
image quality adjustment value storage step, and
similarly the input image is converted into a second
10   image to which an image quality adjustment process
was executed in the image quality adjustment process
step on the basis of an image quality adjustment
value of newly performing an adjustment operation,
then the converted first and second images are
15   displayed on one screen with arranged state in the
multiscreen synthesis step.
[0014]

     To achieve the above object, the invention as
recited in Claim 10 is characterized by an image
20   displaying method comprising: an image enlargement
and reduction step of enlarging and reducing an input
image; a multiscreen synthesis step of composing one
screen by arranging plural pieces of the input image
reduced in the image enlargement and reduction step;
25   an image quality adjustment value storage step of
storing plural combinations of image quality
adjustment values such as lightness, contrast,

chromaticity, hue, RGB balance, color temperature, gamma characteristics, sharpness (emphasis) and the like; and an image quality adjustment process step of executing the image quality adjustment processes for

5   plural images on the basis of each of combinations of the image quality adjustment values stored in the image quality adjustment value storage step, wherein an image quality adjustment process is executed to an input image in the image quality adjustment process

10   step on the basis of an image quality adjustment value before performing an image quality adjustment operation stored in the image quality adjustment value storage step and the input image is converted into a first image which was reduced in the image

15   enlargement and reduction step, and similarly an image quality adjustment process is executed to the input image in the image quality adjustment process step on the basis of an image quality adjustment value of newly performing an adjustment operation and

20   the input image is converted into a second image which was reduced in the image enlargement and reduction step, then the converted first and second images are displayed on one screen with arranged state in the multiscreen synthesis step.

25   [0015]

        To achieve the above object, the invention as recited in Claim 11 is characterized by an image

displaying method comprising: an image enlargement
and reduction step of enlarging and reducing an input
image; a multiscreen synthesis step of composing one
screen by executing a trimming process to a part of

5   the image reduced in the image enlargement and
reduction step and arranging plural pieces of that
image; an image quality adjustment value storage step
of storing plural combinations of image quality
adjustment values such as lightness, contrast,

10   chromaticity, hue, RGB balance, color temperature,
gamma characteristics, sharpness (emphasis) and the
like; and an image quality adjustment process step of
executing the image quality adjustment processes for
plural images on the basis of each of combinations of

15   the image quality adjustment values stored in the
image quality adjustment value storage step, wherein
an image quality adjustment process is executed to an
input image in the image quality adjustment process
step on the basis of an image quality adjustment

20   value before performing an image quality adjustment
operation stored in the image quality adjustment
value storage step and the input image is converted
into a first image which was reduced in the image
enlargement and reduction step, and similarly an

25   image quality adjustment process is executed to the
input image in the image quality adjustment process
step on the basis of an image quality adjustment

value of newly performing an adjustment operation and the input image is converted into a second image which was reduced in the image enlargement and reduction step, then the converted first and second

5   images are displayed on one screen with arranged state in the multiscreen synthesis step.
[0016]

To achieve the above object, the invention as recited in Claim 17 is characterized by a recording

10   medium which records an image display program for controlling an image displaying apparatus by a computer, wherein the program causes the computer to convert an input image into a first image to which an image quality adjustment process was executed on the

15   basis of a stored image quality adjustment value before performing an image quality adjustment operation, and into a second image to which an image quality adjustment process was executed on the basis of an image quality adjustment value of newly

20   performing an adjustment operation, and execute a trimming process to parts of the converted first and second images to display obtained image pieces on one screen with arranged state.
[0017]

25   To achieve the above object, the invention as recited in Claim 18 is characterized by a recording medium which records an image display program for

controlling an image displaying apparatus by a computer, wherein the program causes the computer to execute an image quality adjustment process to an input image on the basis of a stored image quality adjustment value before performing an image quality adjustment operation and convert the input image into a first image which was reduced, and execute an image quality adjustment process to the input image on the basis of an image quality adjustment value of newly performing an adjustment operation and convert the input image into a second image which was reduced, and display the converted first and second images on one screen with arranged state.

[0018]

To achieve the above object, the invention as recited in Claim 19 is characterized by a recording medium which records an image display program for controlling an image displaying apparatus by a computer, wherein the program causes the computer to execute an image quality adjustment process to an input image on the basis of a stored image quality adjustment value before performing an image quality adjustment operation and convert the input image into a first image which was reduced, and execute an image quality adjustment process to the input image on the basis of an image quality adjustment value of newly performing an adjustment operation and convert the

input image into a second image which was reduced, and execute a trimming process to each part of the converted first and second images to display obtained image pieces on one screen with arranged state.

5 [0019]

(function)

According to the present invention, by the above constitution, since an input image is reduced and an image in performing the image adjustment operation is

10 to be displayed arranged with a standard image or an image before performing an adjustment operation treated as a reference image, an effect that difference in the image quality can be easily recognized and a delicate image quality adjustment

15 operation can be easily performed.

[0020]

[Embodiments]

Hereinafter, the embodiments of the present invention will be described in detail with reference

20 to the attached drawings.

(First Embodiment)

Fig. 1 shows the structure of an image processing apparatus in the first embodiment to which the present invention is applied. In Fig. 1, numeral 1 denotes a

25 resolution converter acts as an image enlargement and reduction means. Numeral 6 denotes an image input terminal for inputting a digital video signal. Numerals

21 and 22 respectively denote first and second image
data operation blocks act as an image quality
adjustment process means. Numerals 31 and 32 denote
nonvolatile memories such as first and second EPROM's
(Electrically Erasable Programmable Read-Only Memories)
or the like act as an image quality adjustment value
storage means.

[0021]

Numeral 4 denotes a screen synthesis block acts
as a multiscreen synthesis means. Numeral 5 denotes a
display used for displaying images. Numerals 71 and
72 denote first and second frame memories function as
buffers for temporarily storing image data. Numeral
74 denotes an OSD signal generator for generating a
signal of an OSD (On Screen Display) which visually
displays various operation states or the like for an
operator. Numeral 75 denotes an operation key block
used for performing various operations by the
operator. Numeral 76 denotes a CPU (Central
Processing Unit) which controls the entire of the
image processing apparatus and takes an interface
with the operator.

[0022]

The operation key 75 detects various keys
operations according to operations performed by the
operator and notifies related key data to the CPU 76.
Upon receiving the data input, the CPU 76 controls

the entire of an image display apparatus including the resolution converter 1, the first and second nonvolatile memories 31 and 32, the OSD signal generator 74 and other circuit blocks (not shown).

5 [0023]

Image data input from the image input terminal 6 is reduced to half the size of the original size in longitudinal and lateral directions by the resolution converter 1 and once stored in the frame memories 71

10 and 72. Subsequently, an operation process regarding an image quality adjustment is executed to the reduced image data output from the frame memories 71 and 72 on the basis of image quality adjustment values stored in the first and second nonvolatile

15 memories 31 and 32 in the first and second image data operation blocks 21 and 22. As the image quality adjustment values, for example, various values such as lightness, contrast, chromaticity, hue, RGB (red, green and blue) balance, color temperature, gamma

20 characteristics, sharpness (emphasis) and the like or combinations of these values correspond to the image quality adjustment value.

[0024]

The image quality adjustment value just before

25 starting an image quality adjustment operation is stored in the first nonvolatile memory 31 and the image quality adjustment value in performing the

image quality adjustment operation by the operation
key 75 is stored in the second nonvolatile memory 32
by an instruction from the CPU 76.

[0025]

5   The screen synthesis block 4 arranges the image
data from the image data operation block 21 on a
central position in a left half area in a display
screen, the image data from the image data operation
block 22 on a central position in a right half area

10   in the display screen and superimposes a signal from
the OSD signal generator 74 on a central lower
portion in the display screen, then the display 5
forms images to which a multiscreen synthesis process
was executed.

15   [0026]

       Fig. 2 schematically illustrates the display
screen of the display 5 at this time of the above
state. In Fig. 2, numeral 101 denotes an image just
before starting the image quality adjustment

20   operation, numeral 102 denotes an image in performing
the image quality adjustment operation and numeral
111 denotes an image quality adjustment display
according to the OSD signal generator 74.

[0027]

25   In this case, state of performing an adjustment
operation of "lightness" to the image 102 displayed
on a right side in the screen while comparing it with

the image 101 just before starting the image quality adjustment operation displayed on a left side in the screen is indicated. It should be noted that the reason for giving an adjustment of the "lightness" as an example depends on a fact that the purpose of the present invention has to be illustrated more comprehensible in this description of expressing images in monochrome, and the adjustment is not limited to the lightness. For example, operations of various image quality adjustments such as contrast, chromaticity, hue, RGB balance, color temperature, gamma characteristics, sharpness (emphasis) and the like can be performed.

[0028]

Next, a sequence (processing procedure) of the CPU 76 related to the image quality adjustment will be explained. A flow chart shown in Fig. 3 schematically shows a flow when the CPU 76 performs the image quality adjustment operation.

[0029]

At first, when the operator selects an image quality adjustment mode using the operation key 75, it is shifted to a multiscreen display mode as shown in Fig. 2 in a step 202.

[0030]

Then, a display process based on the OSD is executed in a step 203, an image quality adjustment

value update process of the second nonvolatile memory 32 is executed in accordance with an instruction from the operation key 75 in a step 204 and a checking process of an image quality adjustment mode

5 terminating instruction from the operation key 75 is executed in a step 205. If the image quality adjustment mode terminating instruction does not exist, the flow returns to the step 203 and the above processes are repeated.

10 [0031]

In the step 205, if the image quality adjustment mode terminating instruction exists, the flow advances to a step 206, where an image quality adjustment value stored in the second nonvolatile

15 memory 32 at that time is firstly copied (mapping) to the first nonvolatile memory 31. Then, in a next step 207, the flow is returned to the display mode which is just before the multiscreen display mode shifted in the step 202 and the display according to the OSD

20 signal generator 74 is terminated to exit from a series of the image quality adjustment sequence.
[0032]
(Second Embodiment)

Fig. 4 schematically illustrates a display

25 screen of a display 5 in the second embodiment to which the present invention is applied. In Fig. 4, the same reference numerals as those in the first

embodiment are given. It should be noted that since circuit blocks for realizing the second embodiment are the same as those in the first embodiment shown in Fig. 1, the detailed description thereof will be

5   omitted.

[0033]

In the second embodiment, a reduction ratio in a resolution converter 1 is set 2/3, and both sides of two images are cut out by a screen synthesis block 4,

10 then a trimming process is executed to form images.

[0034]

The trimming process of cutting out both sides of the two images may be executed at the time of executing a reduction process in the resolution

15 converter 1 or writing image data to frame memories 71 and 72.

[0035]

(Third Embodiment)

Fig. 5 schematically illustrates a display

20 screen of a display 5 in the third embodiment to which the present invention is applied. In Fig. 5, the same reference numerals as those in the first embodiment are given. It should be noted that since circuit blocks for realizing the third embodiment are

25 the same as those in the first embodiment shown in Fig. 1, the detailed description thereof will be omitted.

[0036]

  In the third embodiment, a reduction process in a resolution converter 1 is not executed and both sides of two images are cut out by a screen synthesis block 4, then a trimming process is executed to form images. The image quality adjustment display 111 according to the OSD signal generator 74 is superimposed and synthesized on the lowest position in the image 102 in performing the image quality adjustment operation.

[0037]

  The trimming process of cutting out both sides of the two images may be executed at the time of executing a reduction process in the resolution converter 1 or writing image data to frame memories 71 and 72.

[0038]

(Fourth Embodiment)

  Fig. 6 shows the structure of an image processing apparatus for realizing the fourth embodiment to which the present invention is applied. In the structure shown in Fig. 6, a third image data operation block 23 acts as an image quality adjustment process means, a third nonvolatile memory 33 acts as an image quality adjustment value storage means and a third buffer 73 for temporarily storing image data are respectively added to the circuit

structure shown in Fig. 1 in the first embodiment so as to provide three systems in total. Since the functions of each of the blocks are same as those shown in Fig. 1 in the first embodiment, the detailed

5   description thereof will be omitted.

[0039]

The third nonvolatile memory 33 which is newly added stores a default value previously set when the image processing apparatus was shipped or forwarded.

10   In the ordinary operating state, a CPU 76 cannot update this default value.

[0040]

In the fourth embodiment, a reduction ratio in a resolution converter 1 is set 1/2, and the image data

15   from a first image data operation block 21 is arranged on a right upper position in a display screen by a screen synthesis block 4, the image data from a second image data operation block 22 is arranged on a right lower position in the display

20   screen and the image data from the third image data operation block 23 is arranged on a left upper position in the display screen respectively, and a signal from an OSD signal generator 74 is superimposed on a felt lower position in the display

25   screen, then a display 5 forms the image to which a multiscreen synthesis process was executed.

[0041]

Fig. 7 schematically illustrates the display screen of the display 5 at this time of the above-mentioned state. In Fig. 7, the same reference numerals as those in the first embodiment are given. In Fig. 7, numeral 100 denotes an image to which an image adjustment process was executed on the basis of the default value of the image quality adjustment value stored in the third nonvolatile memory 33.

[0042]

Therefore, the standard image 100 based on the image quality adjustment default value is displayed on a left upper position in the display screen and the image 101 just before starting the image quality adjustment operation is displayed on a right upper position in the display screen, and an operator performs an image quality adjustment operation to the image 102 displayed on a right lower position in the screen while comparing it with the above-mentioned images.

[0043]

(Other Embodiments)

In the above first to fourth embodiments according to the present invention, the image data operation blocks 21, 22 and 23 were provided on the following stages of the resolution converter 1. However, mutual positions between the image data operation blocks and the resolution converter 1 may

be replaced, and image data to which the image quality adjustment processes were executed by those image data operation blocks may be respectively reduced by exclusive resolution converters.

5   [0044]

Further, image data operation blocks capable of executing adjustment processes using an individual image quality adjustment value every area in a screen are provided on the following stages of a multiscreen

10 synthesis means as an image quality adjustment process means, and the image quality adjustment process may be executed for one image which is multiscreen synthesized by a screen synthesis block.

[0045]

15 In the first to third embodiment according to the present invention, the image 101 just before starting the image quality adjustment operation and the image 102 in performing the image quality adjustment operation were displayed with arranged

20 state. However, the standard image 100 of the image quality adjustment default value as explained in the fourth embodiment may be displayed instead of the image 101 just before starting the image quality adjustment operation.

25 [0046]

Further, a method of selecting any one image from the standard image 100 of the image quality

adjustment default value or the image 101 just before starting the image quality adjustment operation by an operator and displaying the selected one image as a reference image is also considered.

5 [0047]

In any of the above-mentioned embodiments according to the present invention, the arrangement of the reference image and the image 102 in performing the image quality adjustment operation is

10 not limited to the arrangements as shown in Figs. 2, 4, 5 and 6, and a reduction ratio for the both images and the trimming quantity may be changed.

[0048]

In any of the above-mentioned embodiments

15 according to the present invention, a digital video signal is used as an input image signal. However, it is needless to say that an effect of the present invention does not change in a case where the adjustment process is executed after an analog video

20 signal is A/D (analog-to-digital) converted or an analog process is executed to the image quality adjustment process means itself.

[0049]

The present invention is applicable to a system

25 composed of plural equipments (e.g., a host computer, an interface equipment, a reader, a printer, and the like) or to an apparatus including a single equipment

(e.g., a digital TV receiver, a video camera, a video editing apparatus, and the like).

[0050]

It is needless to say that an object of the present invention can be achieved in a case where a recording medium (storage medium) recording the program codes of a software for realizing the functions of the above-mentioned embodiments is supplied to a system or an apparatus and then a computer (or CPU or MPU) in the system or the apparatus reads and executes the program codes stored in the recording medium.

[0051]

In this case, the program codes themselves read from the recording medium realize the functions of the above-mentioned embodiments, and the recording medium recording such the program codes constitutes the present invention.

[0052]

The recording medium recording the program codes and conversion data such as a table or the like can be, for example, an FD (Floppy Disk), a hard disk, an optical disk, a magnetooptical disk, a CD-ROM (Compact Disk Read-Only Memory), a CD-R (Compact Disk Recordable), a magnetic tape, a nonvolatile memory card (IC (Integrated Circuit) card), a ROM or the like.

[0053]

It is needless to say that the present invention also includes not only a case where the functions of the above-mentioned embodiments are realized by the

5 execution of the program codes read by the computer, but also a case where an OS (Operating System) or the like functioning on the computer executes all the process or a part thereof according to the instructions of the program codes, thereby realizing

10 the functions of the above-mentioned embodiments by the executed processes.

[0054]

[Effect of the Invention]

As explained above, according to the present

15 invention, since the input image is reduced and the image in performing the image adjustment operation is to be displayed arranged with the standard image or the image before performing the adjustment operation treated as the reference image, the effect that

20 difference in the adjustment can be easily recognized and a delicate image quality adjustment operation can be easily performed is obtained.

[Brief Description of the Drawings]

25 Fig. 1 is a block diagram showing the structure of an image processing apparatus in the first embodiment.

Fig. 2 is a schematic view of a displayed image in the first embodiment.

Fig. 3 is a flow chart showing a processing procedure in the first embodiment.

5   Fig. 4 is a schematic view of a displayed image in the second embodiment.

Fig. 5 is a schematic view of a displayed image in the third embodiment.

Fig. 6 is a block diagram showing the structure

10   of an image processing apparatus in the fourth embodiment.

Fig. 7 is a schematic view of a displayed image in the fourth embodiment.

15   [Description of Reference Numerals]

1 … resolution converter acting as image enlargement and reduction means

4 … screen synthesis block acting as multiscreen synthesis means

20   5 … display used for displaying images

6 … image input terminal

21 … first image data operation block acting as image quality adjustment process means

22 … second image data operation block acting as

25   image quality adjustment process means

23 … third image data operation block acting as image quality adjustment process means

31 … first nonvolatile memory such as EEPROM or
     the like acting as image quality
     adjustment value storage means

32 … second nonvolatile memory such as EEPROM or
     the like acting as image quality
     adjustment value storage means

33 … third nonvolatile memory such as EEPROM or
     the like acting as image quality
     adjustment value storage means

71 … first frame memory for temporarily storing
     image data

72 … second frame memory for temporarily storing
     image data

73 … third frame memory for temporarily storing
     image data

74 … signal generator for generating a signal of
     OSD (On Screen Display)

75 … operation key

76 … CPU (Central Processing Unit)

- 47 -

[Document Title] Abstract

[Abstract]

[Problem] In an image processing apparatus having an
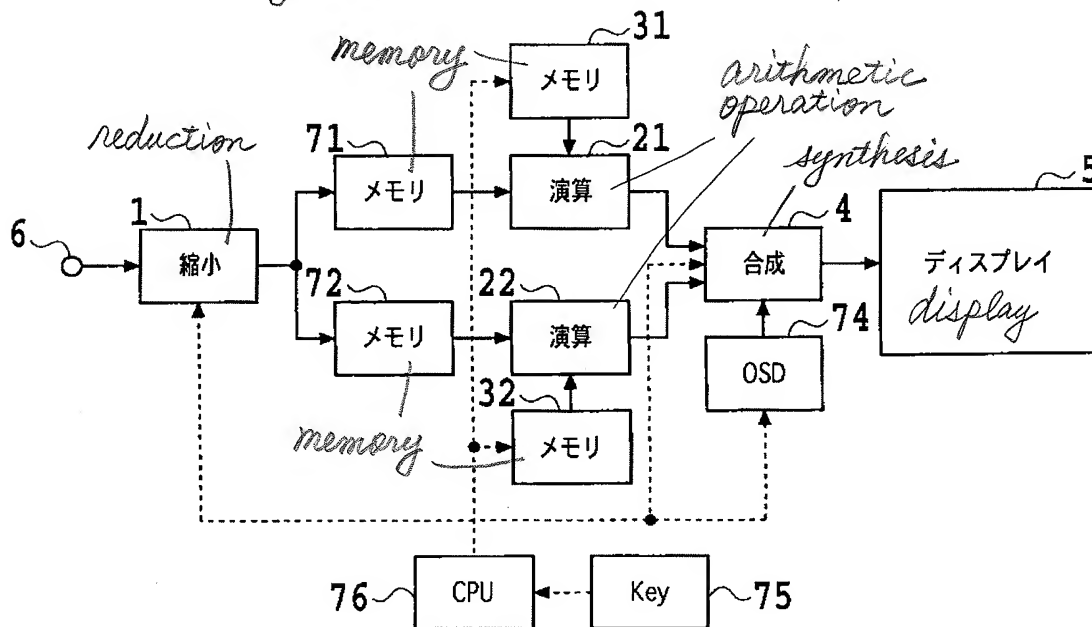image quality adjustment function, to provide
convenience in performing image quality adjustment by
simultaneously displaying a preadjustment image, a
default adjustment image and an adjustment image when
image quality adjustment such as adjustment of
contrast, color balance or the like is performed.

[Means for Achieving Object] Images of the same video
source are simultaneously displayed by a multiscreen
display according to a multiscreen synthesis function.
Further, plural memories such as EPROM's or the like
for storing an image quality adjustment value are
provided. Then, an image 100 in performing the image
quality adjustment operation is displayed on one
screen of a multiscreen, an image 101 just before
starting the image quality adjustment operation is
displayed on another screen of the multiscreen, and
an image 102 of which the image quality was
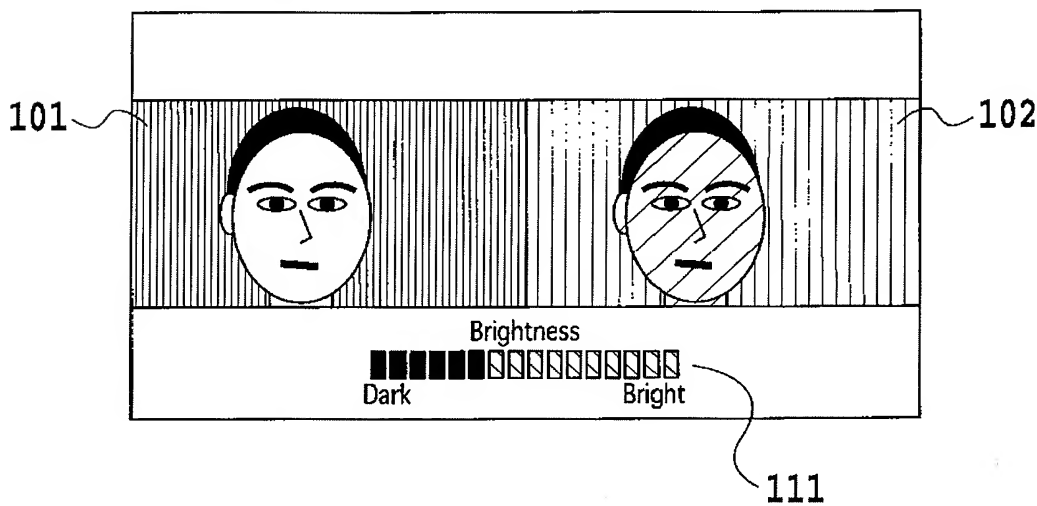previously set at the time of manufacturing is
displayed as a reference image.

[Selective Drawing] Fig. 7
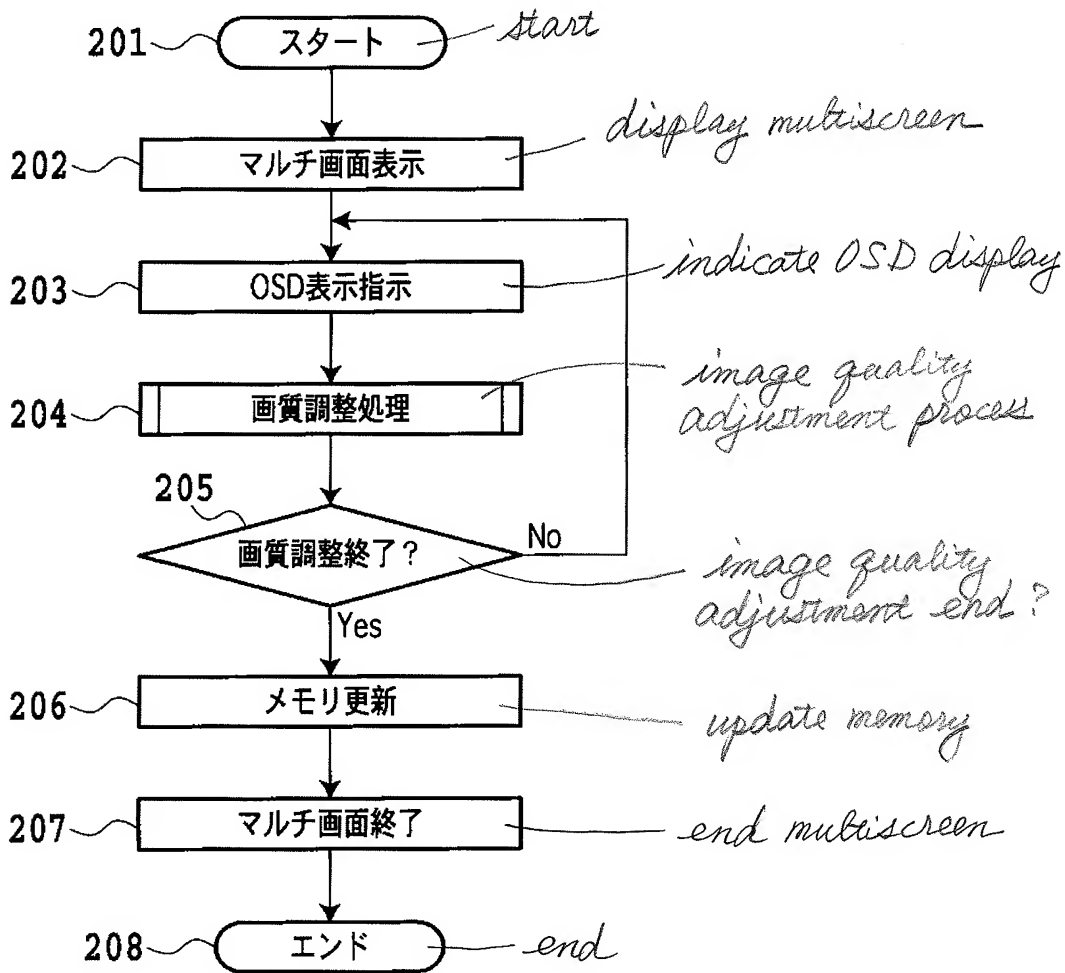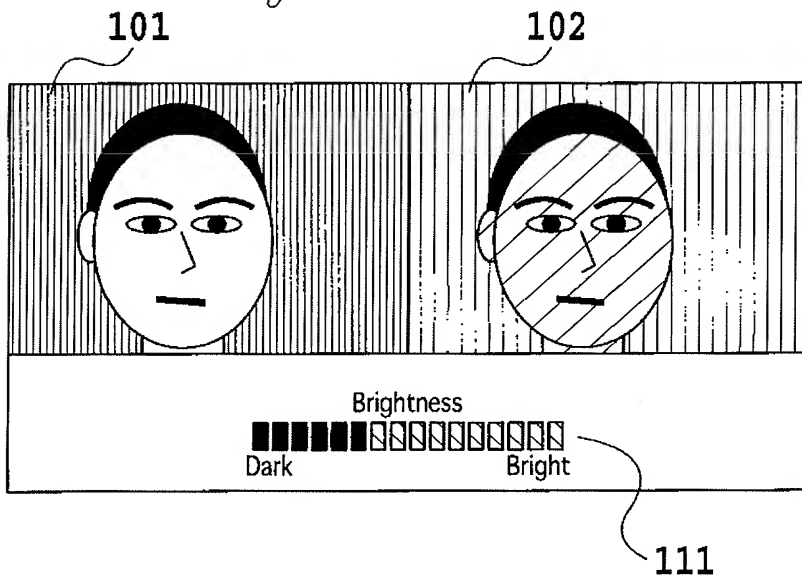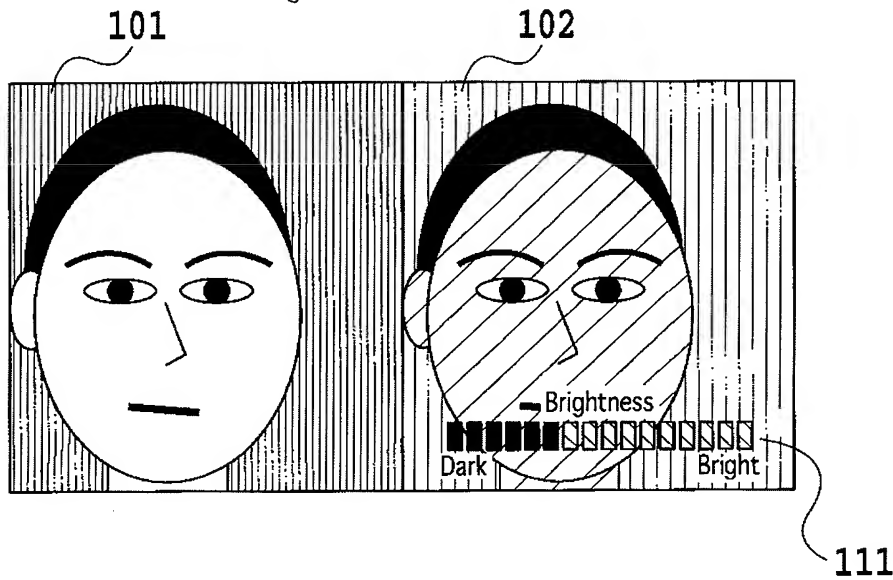
【書類名】　　　　　　図面　[Document Title]　Drawings

【図１】[Fig.1]

memory

arithmetic operation

synthesis

reduction

31 メモリ

71 メモリ　21 演算

6　1 縮小

72 メモリ　22 演算

32 メモリ

memory

4 合成　5 ディスプレイ display

74 OSD

76 CPU　Key 75

【図２】[Fig.2]

101　102

Brightness

Dark　Bright

111

【図3】 [Fig. 3]

201 — スタート — start

202 — マルチ画面表示 — display multiscreen

203 — OSD表示指示 — indicate OSD display

204 — 画質調整処理 — image quality adjustment process

205 — 画質調整終了？ — No — image quality adjustment end?

Yes

206 — メモリ更新 — update memory

207 — マルチ画面終了 — end multiscreen

208 — エンド — end

【図4】 [Fig. 4]

101　102

Brightness

Dark　　Bright

111

【図5】 [Fig.5]

【図6】 [Fig.6]

【図７】 [Fig.7]

Brightness
Dark　　　　　Bright